

WHAT IS CLAIMED IS:

1. A digital can printing apparatus for printing on circular objects, comprising:
a printer for digitally controlled printing of an image on the objects; and
an object transporter for transporting the objects in front of the printer and in registered alignment between each object and the printer and for rotating the individual objects in front of the printer.
2. The digital can printing apparatus of claim 1, wherein the printer includes a plurality of spaced apart digitally controlled print-heads and the transporter is operable for moving the objects to selected ones of the print-heads, for then halting movement of the objects at the selected print-heads, for then rotating the objects while the objects are halted at the selected print-heads, wherein the print-heads are operable for digitally controlled printing of the object then at each of the print-heads..
3. The digital can printing apparatus of claim 2, wherein each print-head is operative to print a single color.
4. The digital can printing apparatus of claim 3, wherein each print-head is operative to print a respective printed pattern.
5. The digital can printing apparatus of claim 2, wherein each print-head is operative to print a respective printed pattern.
6. The digital can printing apparatus of claim 2, wherein the transporter includes

a plurality of mandrels, each mandrel being sized to receive a respective one of the objects, and

a plurality of servo motors, with a respective one of the servo motors being connected to each of the mandrels, the servo motors being operative to rotate and register the respective mandrels in front of each print-head to thereby directly drive the objects to rotate corresponding to an image to be printed on the object by the respective print-head.

7. A digital can printing apparatus of claim 6, wherein the transporter includes a rotatable turret on which the mandrels are mounted so that the mandrels follow a circular path of movement as the turret rotates.

8. The digital can printing apparatus of claim 7, wherein the transporter includes an indexing drive for rotating the turret.

9. The digital can printing apparatus of claim 8, wherein the indexing drive comprises a further servo motor.

10. The digital can printing apparatus of claim 9, further comprising a main support, the further servo motor, the support shaft and the turret being mounted on the main support.

11. The digital can printing apparatus of claim 6, further comprising devices for supplying vacuum or air pressure to the mandrels, and the mandrels are operatively configured to hold objects by vacuum and release objects by air pressure.

12. The digital can printing apparatus of claim 11, wherein the transporter includes a rotatable turret on which the mandrels are mounted so that the mandrels follow a circular path of movement as the turret rotates; and

wherein the devices for supplying vacuum or air pressure comprise valves mounted on the support shaft and the turret for supplying vacuum and air to each of the mandrels.

13. The digital can printing apparatus of claim 6, further comprising a computer control for controlling the servo motors of the mandrels for causing the mandrels to rotate and register pursuant to a selected image to be printed.

14. The digital can printing apparatus of claim 13, wherein the transporter includes a rotatable turret on which the mandrels are mounted so that the mandrels follow a circular path of movement as the turret rotates; and

wherein the computer control is further operative to control the further servo motor for the turret so that each of the mandrels is positioned in front of each of the print-heads for a predetermined period of time during which time the mandrels are rotated so that ink is applied in register by the print-heads.

15. The digital can printing apparatus of claim 2, further comprising a computer control for controlling the image printed on the objects.

16. The digital can printing apparatus of claim 10, further comprising a print-head support, the print-heads being mounted on the print-head support so that the print-heads are

directed toward the mandrels mounted on the turret as the mandrels move along the circular path of movement.

17. The digital can printing apparatus of claim 16, further comprising a base and the main support and the print-head support being mounted on the base.

18. The digital can printing apparatus of claim 12, wherein the print-heads are arranged in two groups, each group of print heads being arranged along an arc concentric with the circular path of movement, wherein one arc has a radius smaller than the radius of the circular path of movement of the mandrels and another arc has a radius larger than the radius of the circular path of movement.

19. The digital can printing apparatus of claim 18, wherein each of the print heads of one group is arranged opposed to one of the print heads of the other group and the path of movement of the mandrels passes between the opposed print-heads.

20. The digital can printing apparatus of claim 7, further comprising a feeder for feeding the objects to the mandrels prior to printing, a varnishing device for varnishing the objects after printing, and a transfer device for transferring the objects from the mandrels after varnishing.

21. The digital can printing apparatus of claim 2, wherein the print-heads are ink-jet print-heads.

22. The digital can printing apparatus of claim 21, further comprising an ink reservoir on the apparatus and connected with the print-heads for supplying ink to the print-heads.

23. A method of decorating circular objects in a decorating apparatus, comprising:
supplying the circular objects to the apparatus, transporting the objects through the apparatus at selected intervals of travel of the objects through the apparatus and halting the transport after each interval;

at the halting of the transport of the objects through the apparatus, rotating the objects and while rotating the objects, digitally printing the rotating objects;

after halting the digital printing, moving the objects another interval of travel and selectively halting the objects and digitally printing the objects again at the next location.

24. The method of claim 23, further comprising before transporting the objects through the apparatus, applying the objects on respective rotation mandrels;

transporting the objects through the apparatus by moving the mandrels, and at the selected locations where the mandrels and objects are halted, rotating the objects by rotating the mandrels thereof, and

after the printing of the objects, removing the objects from the mandrels.

provided with different images, or with the same images in different colors without having to stop the printing apparatus or change printing plates of any type. If desired, it is also possible to print with only selected ones of the print-heads operating and not all of the print-heads of the apparatus. All this is made possible by the digitally controlled print-heads together with the concurrently controlled servo motors.

[43] Thus, while there have been shown and described and pointed out fundamental novel features of the present invention as applied to a preferred embodiment thereof, it will be understood that various omissions and substitutions and changes in the form and details of the devices illustrated, and in their operation, may be made by those skilled in the art without departing from the spirit of the present invention. For example, it is expressly intended that all combinations of those elements and/or method steps which perform substantially the same function in substantially the same way to achieve the same results are within the scope of the invention. Substitutions of elements from one described embodiment to another are also fully intended and contemplated. It is also to be understood that the drawings are not necessarily drawn to scale but that they are merely conceptual in nature. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.